CLAIMS

What is claimed is:

1. An apparatus, comprising:

a first region of an optical waveguide disposed in semiconductor material, the first region having a first conductivity type;

a second region of the optical waveguide disposed in the semiconductor material, the second region having a second conductivity type opposite to the first conductivity type; and

a substantially V shaped insulating region disposed between the first and second regions of the optical waveguide, wherein a vertex of the substantially V shaped insulating region forms an intersecting line that is substantially parallel to an optical path of an optical beam to be directed through the optical waveguide.

2. The apparatus of claim 1 wherein the substantially V shaped insulating region is formed with at least two regions of insulating material having an intersection at the vertex of the substantially V shaped insulating region.

3. The apparatus of claim 2 wherein the two regions of insulating material are formed with a substantially orthogonal relationship between the first and second regions of the optical waveguide.

4. The apparatus of claim 1 wherein the optical waveguide comprises a rib waveguide, wherein the first region in included in a rib portion of the optical waveguide and the second region is included in a slab portion of the optical waveguide.

5. The apparatus of claim 1 further comprising a charge modulated region to be modulated along the optical path of the optical beam and proximate to the substantially V shaped insulating region between the first and second regions of the optical waveguide, the charge modulated region to modulate a phase of the optical beam to be directed through the optical waveguide.

6. The apparatus of claim 5 wherein the optical beam is an arbitrarily polarized optical beam including first and second polarization components, wherein a phase modulation of the first polarization component in response to the charge modulated region is substantially equal to a phase modulation of the second polarization component in response to the charge modulated region.

7. The apparatus of claim 6 wherein the first polarization component is a transverse magnetic field (TM) mode polarization component of the arbitrarily polarized optical beam and the second polarization

component is a transverse electric field (TE) mode polarization component of the arbitrarily polarized optical beam.

8. The apparatus of claim 5 wherein the charge modulated region to be modulated in response to a signal coupled to be received by one of the first and second regions of the optical waveguide.

9. The apparatus of claim 8 further comprising a first contact coupled to the first region of the optical waveguide and a second contact coupled to the second region of the optical waveguide, the first and second contacts coupled to the optical waveguide at locations outside the optical path of the optical beam to be directed through the optical waveguide, wherein the signal is coupled to be received by a corresponding one of the first and second contacts.

10. The apparatus of claim 9 further comprising a buffer region disposed between the optical path of the optical beam and at least one of the locations outside the optical path of the optical beam to which the first and second contacts are coupled to the first and second regions, respectively, of the optical waveguide.

11. A method, comprising:

directing an optical beam along an optical path through an optical waveguide disposed in semiconductor material;

modulating a charge modulated region along the optical path proximate to a substantially V shaped insulating region disposed between first and second regions of the optical waveguide; and

modulating a phase of the optical beam in response to the charge modulated region, wherein the optical beam is an arbitrarily polarized optical beam including first and second polarization components, wherein a phase modulation of the first polarization component in response to the charge modulated region is substantially equal to a phase modulation of the second polarization component in response to the charge modulated region.

12. The method of claim 11 wherein directing the optical beam along the optical path through the optical waveguide comprises directing the optical beam though the optical waveguide substantially parallel to an intersecting line formed at a vertex of the substantially V shaped insulating region through the optical waveguide.

13. The method of claim 11 wherein modulating the charge modulated region along the optical path proximate to the substantially V shaped insulating region disposed between first and second regions of the optical waveguide comprises applying an electrical signal to at least one of the first and regions the optical waveguide, wherein the first region of the

optical waveguide has a first conductivity type and the second region having a second conductivity type opposite to the first conductivity type.

14. The method of claim 11 wherein the optical beam is an arbitrarily polarized optical beam including first and second polarization components, wherein modulating the phase of the optical beam includes modulating substantially equally a phase of the first polarization component of the optical beam and a phase of the second polarization component of the optical beam in response to modulating the charge modulated region proximate to the substantially V shaped insulating region disposed between first and second regions of the optical waveguide.

15. The method of claim 14 wherein the first polarization component is a transverse magnetic field (TM) mode polarization component of the arbitrarily polarized optical beam and the second polarization component is a transverse electric field (TE) mode polarization component of the arbitrarily polarized optical beam.

16. The method of claim 14 wherein the substantially V shaped insulating region is formed with at least two regions of insulating material having an intersection at a vertex of the substantially V shaped insulating region, wherein the charge modulated region proximate to the first region of the insulating material is adapted to modulate the phase of the first

polarization component an amount substantially equal to an amount that the charge modulated region proximate to the second region of the insulating material is adapted to modulate the phase of the second polarization component.

17. A system, comprising:

an optical transmitter to generate an optical beam, wherein the optical beam is an arbitrarily polarized optical beam;

an optical receiver optically coupled to receive the optical beam; and

an optical device optically coupled between the optical transmitter and the optical receiver, the optical device including an optical phase shifter to modulate a phase of the optical beam, the optical phase shifter including:

a first region of an optical waveguide disposed in semiconductor material, the first region having a first conductivity type;

a second region of the optical waveguide disposed in the semiconductor material, the second region having a second conductivity type opposite to the first conductivity type; and

a substantially V shaped insulating region disposed between the first and second regions of the optical waveguide, wherein a vertex of the substantially V shaped insulating region forms an intersecting line that is substantially parallel to an optical path of the optical beam to be directed through the optical waveguide.

18. The system of claim 17 wherein the substantially V shaped insulating region is formed with at least two regions of insulating material having an intersection at the vertex of the substantially V shaped insulating region.

19. The system of claim 17 wherein the two regions of insulating material are formed with a substantially orthogonal relationship between the first and second regions of the optical waveguide.

20. The system of claim 17 further comprising a charge modulated region to be modulated along the optical path of the optical beam and proximate to the substantially V shaped insulating region between the first and second regions of the optical waveguide, the charge modulated region to modulate a phase of the optical beam to be directed through the optical waveguide.

21. The system of claim 20 wherein a phase modulation of the first polarization component in response to the charge modulated region is substantially equal to a phase modulation of the second polarization component in response to the charge modulated region.

22. The system of claim 17 wherein the optical phase shifter is included in an optical modulator included in the optical device, the optical

modulator to modulate an amplitude of the optical beam directed from the optical transmitter to the optical receiver.

23. The system of claim 22 wherein the optical modulator includes a Mach-Zehnder interferometer (MZI) configuration having first and second arms, wherein the optical phase shifter is included in at least one of the first and second arms to modulate the optical beam directed through the MZI configuration.

24. The system of claim 22 wherein the optical modulator includes a Fabry-Perot cavity configuration, wherein the optical phase shifter is included in Fabry-Perot cavity configuration to modulate the optical beam directed through the Fabry-Perot cavity configuration.